Building a Pilot Data Exchange System for Environmental Public Health Tracking Network in New York State

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Background

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- A National Environmental Public Health Tracking (EPHT) Network is being built that integrates data about environmental hazards and exposures with environment-related health outcomes
- In 2004, in collaboration with NYSDEC, NYSDOH has designed and developed a Data Exchange System based on NYSDOH Health Commerce Network infrastructure and using the Public Health Information Network Messaging System (PHINMS) v2.0 for automated data transport.

NYSDOH Health Commerce Network

- NYSDOH has developed an enterprise-wide architecture for secure, Internet-based, health-related electronic commerce
- Supports over 100 web-based applications and 27,000 users mostly health care practitioners, with an estimated 100,000 users within next year
- Connect all local health departments, local social service units, hospitals, nursing homes, community health centers, pharmacies and health care practitioners, and all clinical and environmental laboratories licensed to serve in NYS

What is PHINMS

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- PHINMS is software developed by the Centers for Disease Control and Prevention (CDC) to securely transmit public health information over the Internet.
- The PHINMS software is based upon open industry standards (ebXML, XML Signature, SOAP, etc) and includes a client entity module (the sending site) and a server entity module (the receiving site).
- NYSDOH has been committed to a full partnership with CDC to be the first state to develop and fully deploy PHINMS for Business to Business (B2B) Infrastructure.

Needs for Enhancements

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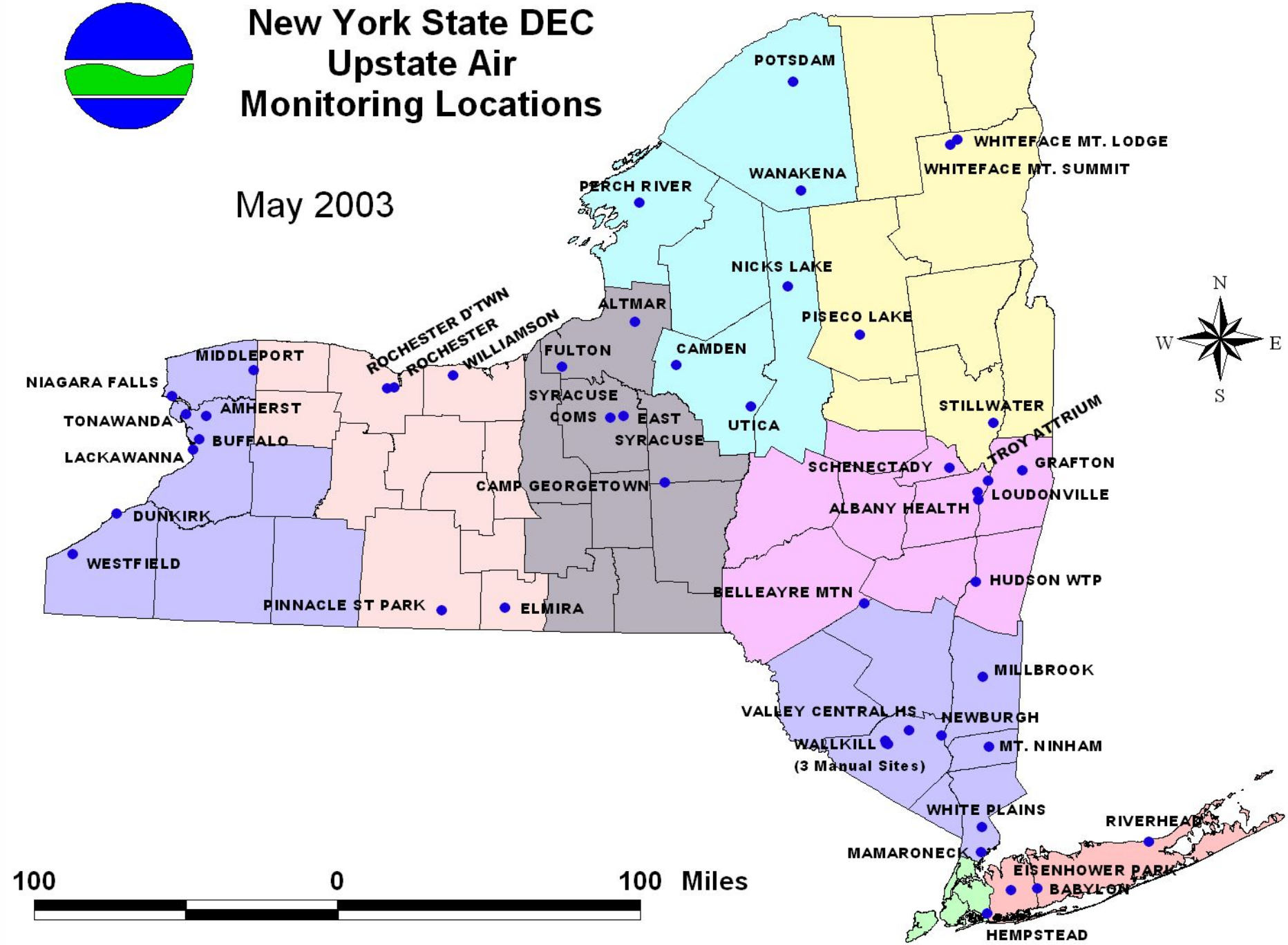
- Need to extend the original project objectives by bringing forward the integration of the Exchange Network and NYSDEC Network Node.
- Automated and “real-time” data flow from NYSDEC to NYSDOH for ambient air quality monitoring data.
- Take advantage of the air quality monitoring data standards of EPA but also meet specific requirements of EPHT program in NYS.
- Ensure the timeliness and accuracy of air quality monitoring data for EPHT surveillance and research activities.
- Reduce the effort, cost and time needed to transmit data in the future.

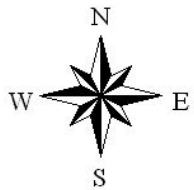
New York State DEC Upstate Air Monitoring Locations

May 2003



New York State DEC
New York City Air
Monitoring Sites

May 2003



NY BOTANICAL GARDENS
IS 143
MORRISANIA II
MANHATTANVILLE POST OFFICE
IS 52
PS 154
IS 74
JHS 45
COLLEGE PT PO
PS 59
MIDTOWN-MADISON AVE
EAST 34TH ST
PS 219
PS 19
MASPETH LIBRARY
QUEENS COLLEGE 2
CANAL STREET PO
PS 64
JHS 126
PARK ROW
BROOKLYN TRANSIT
PS 274
IS 293
HEMPSTEAD
PORT RICHMOND PO
PS 44
SUSAN WAGNER
FRESH KILLS WEST
FRESH KILLS EAST
LATOURETTE
UNLOADING ZONE

6 0 6 Miles

NYSDEC Information Technology Infrastructure

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- NYSDEC has developed an enterprise information architecture for both internal and external needs.
- Supports more than 250 client/server and web applications and 4000 users.
- NYSDEC is a recent recipient of an Environmental Information Exchange Network grant from the EPA to develop and expand the infrastructure to exchange environmental-related data.
- NYSDEC has been developing its technical infrastructure for implementing the EPA Exchange Network node in New York State that went into production in November 2004.

EPA Exchange Network

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- The EPA Exchange Network is a new approach for exchanging environmental data between EPA, States, and other partners, using the Internet and standardized data formats.
- Consist of data exchanges between “nodes” or portals maintained individually by participating partners.
- An Exchange Node is a simple web service that initiates or responds to requests for information, processes authorized queries, and sends/receives the requested information in XML standard format

Vision of an Enhanced Data Exchange System

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- Ambient air quality monitoring information will be extracted from NYSDEC air program database and formatted according to an agreed XML schema.
- The resulting XML document will be passed through the NYSDEC Exchange Network Node Web services to the PHINMS Message Receiver service across the Internet.
- NYSDOH will then process the received data into their own database for analysis and linkage to other NYSDOH health data sources for EPHT Surveillance
- NYSDOH may then make the data available to CDC and/or other agencies in an agreed upon format within the National EPHT Network.

High Level System Design

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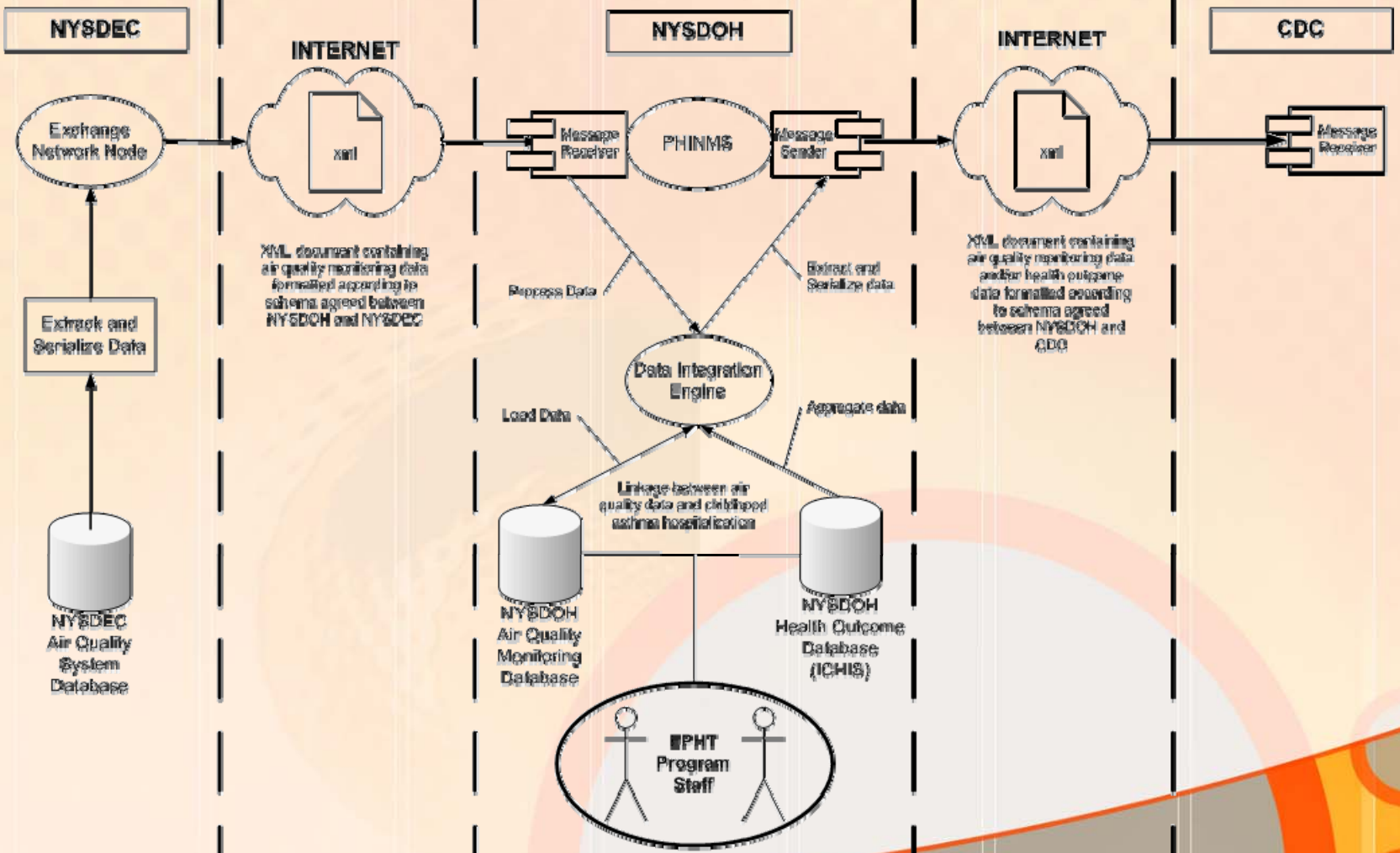

Feasible Technical Approaches

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- Add module (plug-in) to the Exchange Node that would enable it to become a PHINMS client and send directly to the PHINMS server.
- Use the Exchange Node to produce an extract and place that extract into a location at NYSDEC for a local PHINMS client installation to pick it up and send it to the NYSDOH PHINMS server.
- Modify the PHINMS and Exchange Network standards to accommodate intersystem communication.
- Install an Exchange Node at DOH and send directly to the DOH Node from the DEC Node.

Add module (plug-in) to the Exchange Node

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- **Pros**
  - The methodology in this approach may be more applicable in a broad sense, for other agencies, states, or partners.
  - NYSDOH has already developed JAVA code that could be utilized in the Exchange Node plugin.
- **Cons**
  - ebXML format requires extensive and lengthy certification, and can be problematic to implement.
  - Using DOH code within the Exchange Node would require maintenance and update synchronization.
  - This approach could be dependant on added functionality to the NYSDEC Node implementation to facilitate scheduling.

Use the Exchange Node to produce an extract file for PHIMS

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- **Pros**
  - There is already a PHINMS client in place at NYSDEC and the NYSDEC Node already produces extract files. This approach would require only moderate effort to implement the interface.
- **Cons**
  - This approach could be dependant on added functionality to the NYSDEC Exchange Node implementation to facilitate scheduling.
  - The current implementation of PHINMS authentication is resource intensive.
  - There would be minimal benefit to entities outside of NYS as this solution would be highly specific to the unique configurations employed at NYS DEC and DOH.
  - Requires implementation and maintenance of PHINMS client by DEC.

Modify the PHINMS and Exchange Network standards

- **Pros**
  - This solution is the best possible solution long term, and on a national level. This would facilitate the future integration of all agencies or entities that utilize the Exchange Node and PHINMS.
- **Cons**
  - This would require consensus amongst EPA, CDC, and State and Local users. Additionally it would require new standards to be established, approved, tested, and deployed.
  - The required coordination and buy-in from disparate agencies could cause delay in design and implementation.

Install an Exchange Node at NYSDOH to receive data directly from the NYSDEC Node

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- **Pros**
  - The NYSDEC Node implementation is broadly standards based, and a small scale installation is not manpower or server intensive.
  - This would be an efficient use of resources, as the data to be sent from NYSDEC to NYSDOH is not in need of the elaborate methods of authentication and high security levels PHINMS provides.
- **Cons**
  - There would be minimal benefit to entities outside of NYS as this solution would be highly specific to the unique configurations employed at NYS DEC and DOH.
  - The Exchange Node at NYSDOH would be another exposed system, which would need to be tested and meet NYSDOH security requirements and standards

Final Technical Solution

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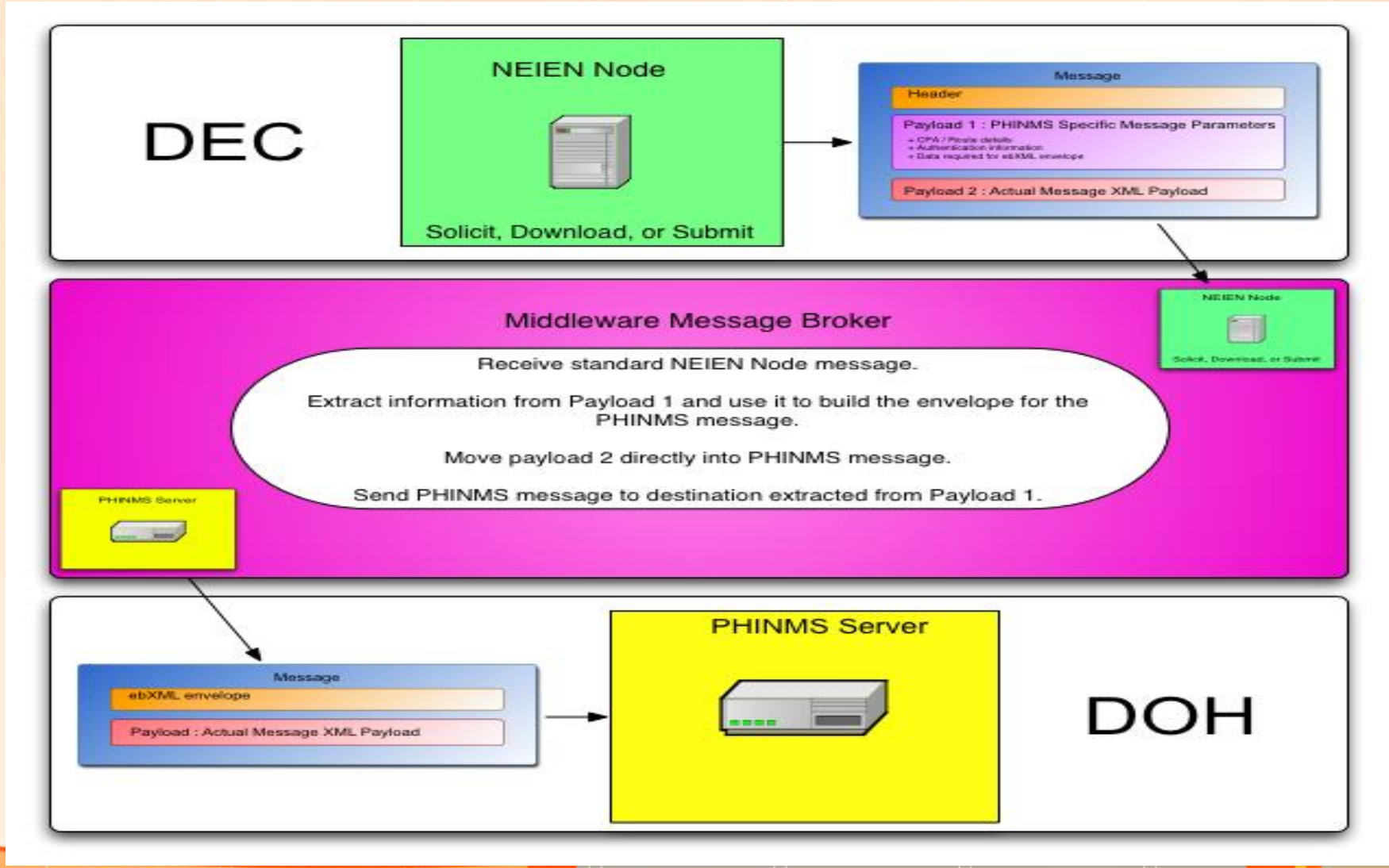
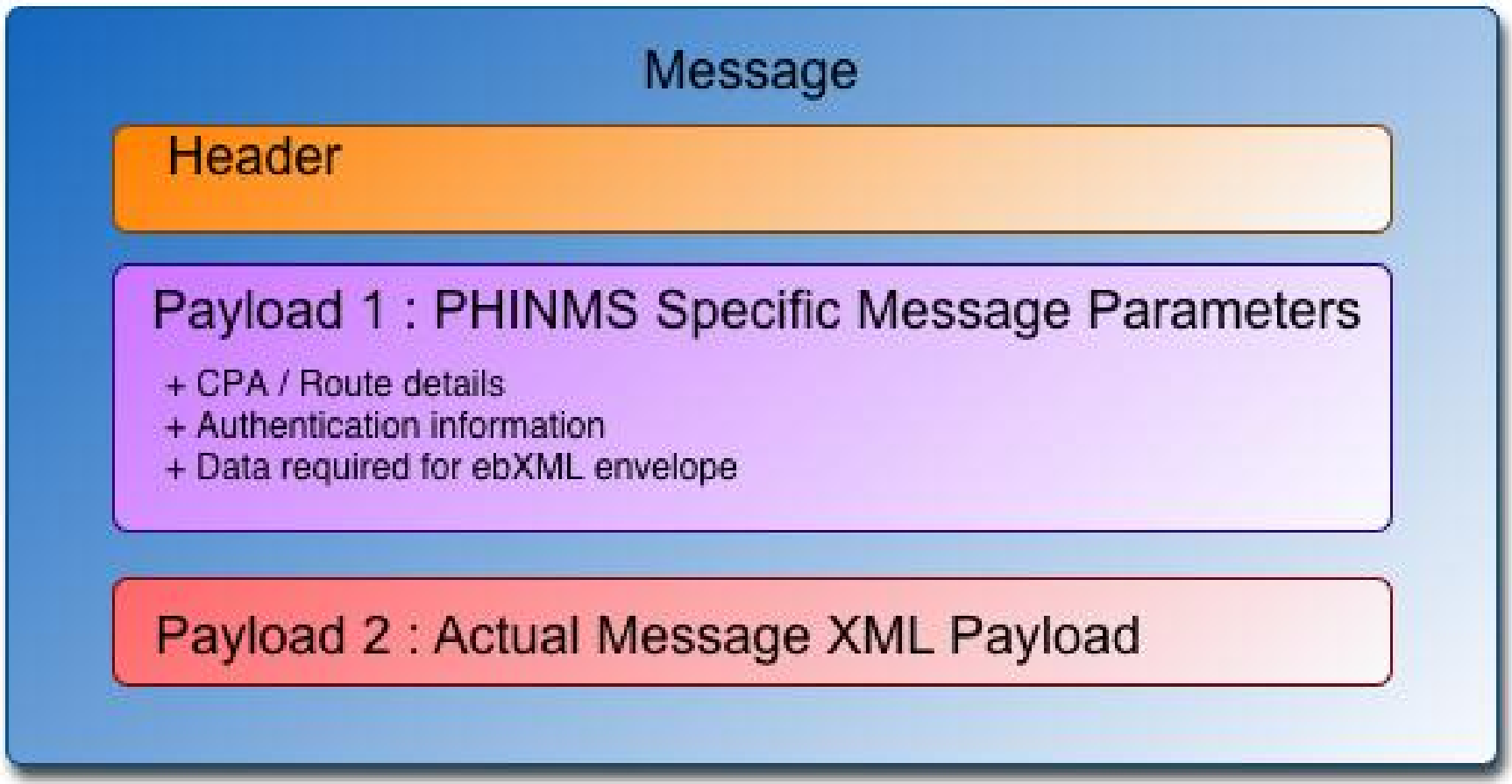
- Build a middleware message broker that is a standalone Java application.
- Act as intermediary between an Exchange Network Node and a PHINMS receiver.
- Receives a Node message, translates it to a PHINMS message and pass it to the destination.
- Will be able to operate in any situation where a Node needs to pass messages to PHINMS, and will not be environment or agency specific.
- Will initially only handle messages sent from NYSDEC to NYSDOH (in future will be capable of bi-directional transfers).
- Designed to be hosted by any party in any location, and utilized for unlimited data flows.

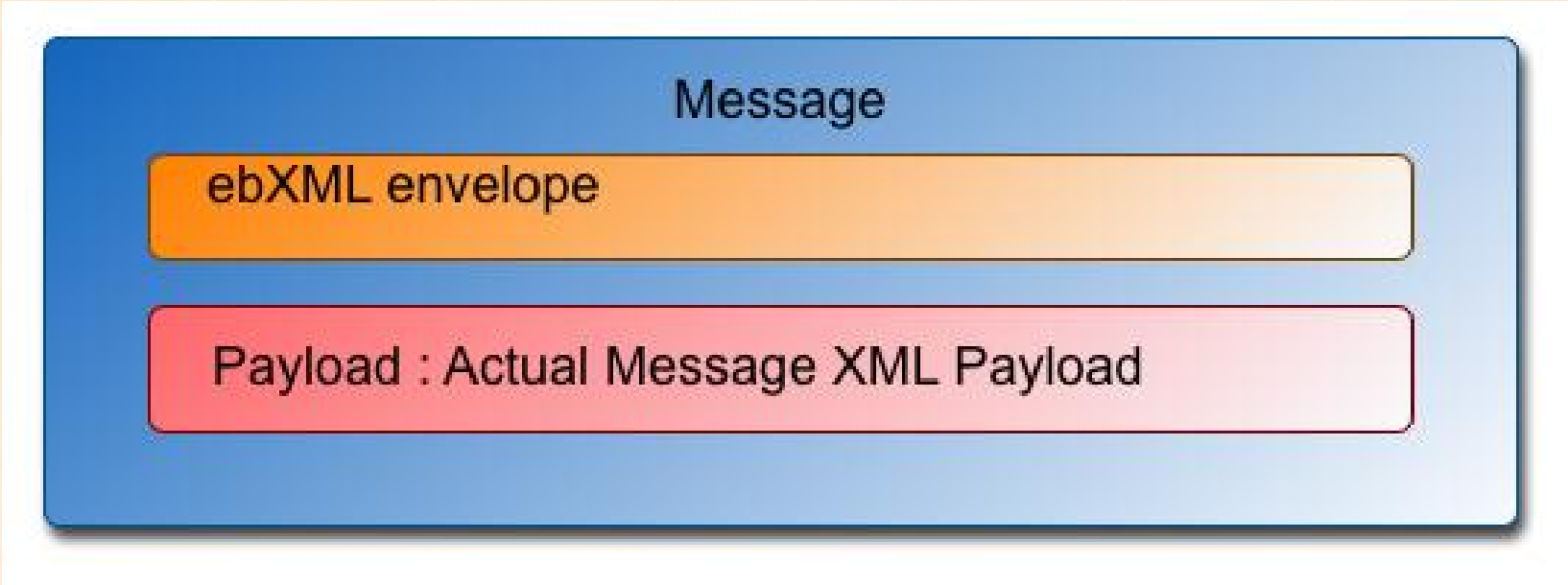
Overview of the Integration Broker



Message from Exchange Node to Broker



Message from Broker to PHINMS



Advantages

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- Universally acceptable.
- Requires no modifications to Exchange Network Node or PHINMS.
- Could be used by more than just NYSDOH and NYSDEC (for example NYS DEC and New Jersey public health, or NYS DOH and New Jersey environmental)
- Could leverage existing Node and PHINMS code base

Limitations

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- Larger/more complicated development effort
- Would need to be accessible by all parties
- Authentication and security issues (the broker would act like a proxy which would make authentication and verification of users difficult)

Project Status

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- Core application classes have been developed and being tested for communication with PHINMS
- A final XML schema of the air quality monitoring dataset to be exchanged has been defined
- Data flow for the air quality monitoring data has been finalized and being implemented
- An integrated data repository for air quality monitoring data is being designed in NYSDOH, which will allow both longitudinal and geographical linkage with health outcome data

Future Activities

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- Expand the system for additional data flows with NYSDEC including other types of regulated and un-regulated environmental releases to NYSDOH to support exposure tracking and correlation of human health effects.
- Implement bi-directional data flows with a reciprocal flow of drinking water quality data from NYSDOH will serve to further enhance the data exchange and increase the mutual benefits to the two agencies.
- Collaborate with New York City Dept of Health to take advantage of the infrastructure of the Electronic Clinical Laboratory Reporting System (ECLRS) for data exchange between the two EPHT programs and within the region

Discussions

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- Essential component of the infrastructure for the EPHT Network.
- The EPHT program is essentially a data linkage and public health surveillance program, and the data linkage is predicated upon the continuous, automated exchange of data between different agencies.
- Experience from this project will be shared with other state and federal agencies, demonstrating the ability to exchange data between respective state and national systems and providing feedback and lessons learned for other states that are embarking on similar projects.